AmerenUE
Callaway Plant

PO Box 620
Fulton, MO 65251

February 05, 2009

ULNRC-05585

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop P1-137
Washington, DC 20555-0001

10CFR50.73(a)(2)(iv)(A)

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 2008-005-00
REACTOR MANUALLY TRIPPED DUE TO "B" CONDENSATE PUMP TRIPPING DUE TO A MOTOR GROUND FAULT

The enclosed licensee event report is submitted in accordance with 10CFR50.73(a)(2)(iv)(A) to report an event of a manual reactor trip due to having fewer than two condensate pumps running at greater than 45-percent reactor power per plant operating procedures. With two of three condensate pumps running, the "B" condensate pump unexpectedly tripped due to a stator winding failure of the pump motor.

This letter does not contain new commitments.

Sincerely,

David W. Neterer
Plant Director

EMF/nls

Enclosure

IE22
NRR

cc: Mr. Elmo E. Collins, Jr.
Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
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Arlington, TX 76011-4125

Senior Resident Inspector
Callaway Resident Office
U.S. Nuclear Regulatory Commission
8201 NRC Road
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Mr. Mohan C. Thadani (2 copies)
Licensing Project Manager, Callaway Plant
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U. S. Nuclear Regulatory Commission
Mail Stop O-8G14
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Index and send hardcopy to QA File A160.0761

Hardcopy:

Certrec Corporation
4200 South Hulen, Suite 422
Fort Worth, TX 76109
(Certrec receives ALL attachments as long as they are non-safeguards and may be publicly disclosed.)

LEREvents@inpo.org (must send the **WORD** version of the LER to this address)

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APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Callaway Plant Unit 1	05000 483	1 OF 5

4. TITLE
Reactor Manually Tripped Due to "B" Condensate Pump Tripping Due to a Motor Ground Fault

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	14	2008	2008	- 008 -	00	02	05	2009	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE
1

10. POWER LEVEL
098

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
T. B. Elwood, Supervisor, Regulatory Affairs	(573) 676-6479

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	SD	MO	A180	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On 12/14/2008, while operating at 98-percent reactor power with two of three condensate pumps available and running, the control room received steam generator (SG) feed flow/steam flow mismatch annunciators followed by SG level deviation alarms. Immediately thereafter, control room operators confirmed the loss of the "B" condensate pump. With only one condensate pump running at greater than 45-percent reactor power, the reactor was manually tripped.

All control rods inserted during the event and all safety systems responded as designed. Operation of the Auxiliary Feedwater system restored SG levels. Operation of the main steam supply system adequately provided the heat sink for decay heat removal following shutdown. No primary to secondary leakage existed. No radioactive material was released. This event was considered an uncomplicated reactor trip.

The cause of the "B" condensate pump trip is a stator turn-to-turn winding failure of the pump motor that progressed to a ground fault. The Root Cause is voltage surge damage to motor winding insulation. The Corrective Action to Prevent Recurrence is to install surge capacitors at the condensate pump motor lead boxes to minimize the slope of the voltage transient wave front.

All times are approximate and Central Standard Time unless otherwise stated.

I. DESCRIPTION OF THE REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

10CFR50.73(a)(2)(iv)(A) requires reporting of any event or condition that resulted in a manual or automatic actuation of any of the systems listed in 10CFR50.73(a)(2)(iv)(B). The systems listed below are relevant to this LER:

(1) Reactor protection system (RPS) including: reactor scram or reactor trip; and
(6) PWR auxiliary or emergency feedwater system.

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

The plant was in MODE 1, Power Operation, at 98-percent reactor power at the time the event occurred.

C. STATUS OF STRUCTURES, SYSTEMS OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT

No safety-related structures, systems, or components were inoperable during the event which contributed to the event. The "C" condensate pump [EIIS system: SD, component: P] was unavailable at the time of this event and contributed to the event. The failure of the "C" condensate pump motor [EIIS system: SD, component: MO] is documented in LER 2008-006.

D. NARRATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES

On the afternoon of December 14, 2008, the Callaway Plant was operating at 98-percent reactor power with two of three condensate pumps available and running, and the Operations Department had completed a switching evolution of the switchyard breakers. The control room received all four steam generator (SG) [EIIS system: AB, component: SG] feed flow/steam flow annunciators. A few seconds later, the control room received all four SG level deviation alarms. From indications that the main feed pump suction pressure was below 240 psig, the reactor operator determined that the "B" condensate pump had tripped. No electrical switching was being performed at the time of the pump trip.

The function of the condensate pumps is to transfer condensate from the condenser [EIIS system: SD, component: COND] to the suction of the main feed pumps [EIIS system: SJ, component: P], to provide seal water to the condensate and turbine-driven main feed pumps, and to circulate condensate through the condensate demineralizers [EIIS system: SD, component: FDM] and low pressure feedwater heaters [EIIS system: SD, component: HX].

Per control room logs, the "B" condensate pump tripped at 17:12:39 on December 14, 2008. The control room personnel observed that the main feed pump suction pressure was less than 240 psig and reactor power was in excess of 45-percent with only one condensate pump running, which is the

administrative set point for a manual reactor trip per plant operating procedure OTO-AE-00001, Feedwater System Malfunction. The Shift Manager directed the Control Room personnel to manually trip the reactor. The operating crew tripped the reactor at 17:13:12, according to the control room logs.

All control rods [EIIS system: AA, component: ROD] fully inserted during the event and all safety systems responded as designed. An Auxiliary Feedwater (both motor-driven and turbine-driven) [EIIS system: BA, component: P] actuation and a Main Feedwater Isolation [EIIS system: SJ, component: ISV] actuation occurred as expected. Because these systems responded properly during this event, no additional operator actions or use of other systems/components as a backup function were required, and the plant operators were able to maintain safe shutdown conditions. Operation of the Auxiliary Feedwater system restored SG levels, and use of the Main Steam Supply System [EIIS system: SB] provided decay heat removal following shutdown. This event was considered an uncomplicated reactor trip. During the forced outage, the plant remained stable in Mode 3, Hot Standby.

On 12/15/2008 the "B" condensate pump motor was shipped offsite to a vendor. The "C" condensate pump motor was already offsite for repairs. The vendor performed a destructive examination of the motor to determine the cause and then performed repairs on the motor. The vendor rewound and then tested the motor. The "B" condensate pump motor was returned to the site on December 22, 2008. Reactor startup commenced on December 22, 2008. The plant went on-line on December 23, 2008, thus ending the forced outage.

E. METHOD OF DISCOVERY OF EACH COMPONENT, SYSTEM FAILURE, OR PROCEDURAL ERROR

Given the nature of the pump motor failure and the indications received in the control room in response to the pump trip, the condition was self-revealing. Causal factors, as well as a root cause, were determined through the use of a seven-step root cause analysis, with assistance from the vendor who performed the destructive examination.

II. EVENT DRIVEN INFORMATION

A. SAFETY SYSTEMS THAT RESPONDED

All safety systems functioned as designed. The motor-driven Auxiliary Feedwater actuation, turbine-driven Auxiliary Feedwater actuation, and Main Feedwater Isolation actuation occurred as expected.

B. DURATION OF SAFETY SYSTEM INOPERABILITY

No safety-related structures, systems, or components were inoperable during the event which contributed to the event.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT.

As directed by plant operating procedures, a manual reactor trip was initiated in response to the loss of the non-safety grade "B" condensate pump which left only one condensate pump available and running at greater than 45-percent reactor power. A reactor trip is considered an ANS Condition II event which is defined as a condition that, once corrected, will allow the plant to return to operation.

The event actuated safety grade systems that responded as designed and which fulfilled their intended safety functions. Because these systems responded properly during this event, no additional operator actions or use of other systems/components as a backup function were required. The plant operators were able to maintain safe shutdown conditions. Operation of the Auxiliary Feedwater system and main steam supply system adequately removed decay heat following the shutdown. No release of radioactive material was associated with this event. At no time was the plant in an unanalyzed or safety significant condition.

III. CAUSE(S) OF THE EVENT AND CORRECTIVE ACTION(S)

This event was evaluated using a seven-step root cause analysis process. The Root Cause Team concluded that there was a single Root Cause with two Causal Factors.

The condensate pump motors are Allis Chalmers VersaPac three-phase wye-wound vertical induction motors rated at 3500 hp, 1184 rpm, and 4000 volts. Destructive examination performed by the vendor identified that a causal factor for the failure was a winding failure in the "B" condensate pump motor stator, along with the root cause of a voltage surge causing damage to the motor insulation. As described in Callaway LER 2008-006, the "C" condensate pump motor previously failed on December 11, 2008, also due to a motor ground fault failure.

Voltage transients occur in most electrical systems and are usually caused by voltage surges from breaker contactor switching. These surges often originate from normal switching actions within the plant and are less likely to occur from lightning strikes. Motors that run continuously have a higher probability of experiencing voltage surges caused by any type of electrical disturbance on the bus.

Fast rise time surges can cause severe voltage stress on the turn insulation due to the non-uniform distribution of voltage across the winding. Typically, the voltage becomes uniformly distributed across the turns for rise times that are longer than approximately 1 microsecond. Some equipment characteristics that may influence these effects include cable length, cable size, insulation condition, common bus electrical loads, and switching sequence. As such, it was identified that an additional causal factor is the close proximity (i.e., cable length ~150 feet) from the supplying electrical bus to the motors, which makes them more susceptible to voltage surges than other motors on the same busses.

During the extent of condition investigation of the similar failures for the "B" and "C" condensate pump motors, the "A" condensate pump motor was sent offsite to a vendor for testing. The "A" condensate pump motor was determined to not have the same degradation as the "B" and "C" condensate pump motors.

This issue has been entered into Callaway's corrective action program. The Corrective Action to Prevent Recurrence (CATPR) was to have surge capacitors installed at the condensate pump motor lead boxes to minimize the slope of the voltage transient wave front. By elongating the rise time of the surges, less of the full surge voltage will appear across any one coil or any two turns in the winding, thereby providing protection to the motor from future voltage surges. This will maintain the winding integrity and prevent a turn-to-turn fault. This Action is completed for all of the condensate pump motors.

IV. PREVIOUS SIMILAR EVENTS

A search of the Callaway corrective action request system (CARS) identified four occurrences similar to the event of 12/14/2008:

A review of these events determined that three of the occurrences were motor failures, but with causes different than the cause of the 12/14/2008 event, and are therefore not relevant operating experience for this event. One event was determined to be directly applicable to the 12/14/2008 event: the failure of the "C" condensate pump motor that occurred just prior to the "B" condensate pump motor failure. It has been determined that this event occurred due to a common cause, and it has been evaluated in connection with the "B" condensate pump motor failure addressed in this LER.

V. ADDITIONAL INFORMATION

The system and component codes listed below are from the IEEE Standard 805-1984 and IEEE Standard 803A-1983, respectively.

System:	AA	Control Rod Drive System
Components:	ROD	Rod
System:	AB	Reactor Coolant System (PWR)
Components:	SG	Generator, Steam
System:	BA	Auxiliary/Emergency Feedwater System (PWR)
Components:	P	Pump
System:	SB	Main/Reheat Steam System
System:	SD	Condensate System
Components:	COND	Condenser
	FDM	Demineralizer, Filter
	HX	Exchanger, Heat
	MO	Motor
	P	Pump
System:	SJ	Feedwater System
Components:	ISV	Valve, Isolation
	P	Pump